ORIGINAL ARTICLES

From the Society for Vascular Surgery

Presidential address: Legend, leadership, legacy

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Every year, the Society for Vascular Surgery bestows a singular honor on one of its members, its Presidency. Fifty-one of my predecessors have expressed their gratitude for this in various ways, but I'm sure all felt as I do: that to be elected to this office by one's peers is indeed a supreme recognition. And for me, it resulted in one of life's very high moments. I know no other way to convey this than to sincerely say, thank you; thank you for this honor, privilege, and opportunity to have served you.

The title of this address reflects my acute awareness that we are in a time of great transition. "Legend, leadership, legacy" is translatable to the past, the present, and the future, but with specific implications.

First, we must not, in this chaotic time of change, forget that we are the custodians of the welfare of our patients, who are afflicted with the devastating illness of vascular disease. Second, we must not succumb to the tremendous pressures to change until and unless we really know that it is the right thing to do.

All this is in the presence of enormous external forces largely out of our control. Our work is being devalued, our creativity is being strangled, our finances are being eroded, and our turf is under attack. Our very lives are being forced to change in an era in which everything is happening much too fast, and there is no time for reflection.

But reflect we must. We must take a deep breath and consider where we've been, where we are, and where we are going. Legend, leadership, and legacy—we must draw on these concepts to develop a steady and correct course. Thus, this address will be historical, philosophical, rhetorical, and, lastly, somewhat personal.

From the Division of Vascular Surgery, Massachusetts General Hospital.
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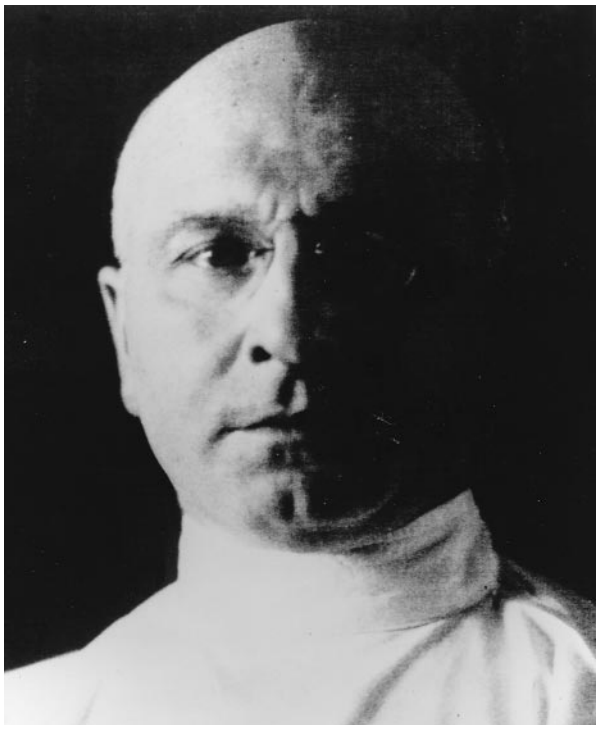

Fig 1. Alexis Carrel, circa 1930.

Legend is the record of the past, what worked, and who did it. The results are the major contributions to our field. Legacy is what happens if what is done turns out to be the right thing, thereby resulting in future success. Leadership is what is needed to make the right decisions to achieve that success. Leaders must possess a blend of skills, including boldness, wisdom, and judgment. Leadership is the linkage of the past to the future—from the legend to the legacy. It is this linkage that is crucial to the preservation and nurturing of our collective creativity and identity—issues to which I will return later.

As an example of legend, I have chosen a person whose contributions began 100 years ago, continued through the 1930s, and took 20 to 30 more years for their full impact to be realized, Alexis Carrel (Fig 1). Through a detailed review of the life,

the work, and the creativity of Carrel, I hope you will gain insight on the legend-to-legacy issue.

Alexis Carrel was born outside Lyons, France, in 1873 and died in Paris in 1944. No previous president spent much time on Carrel, and I always wondered why. It was not until 1974 that a biography of him was written in English, by Sterling Edwards. Edwards must also have wondered why no one had spent much time on Carrel. With this excellent book, I started my research. Carrel was a creative genius, with all the assets and all the faults. He was the first scientist working in North America to win a Nobel Prize in physiology and medicine, in 1912 for the work about which we all know. But that work is just an instant in the life of a rather extraordinary person.

I first became aware of Carrel when I was in the Navy at the Naval Medical Research Institute's Tissue Bank, and Carrel's work on organ culture was being reproduced and extended there with the consultation of Charles Lindbergh, who had worked with Carrel 30 years before. The general, as he was called, used to come every several months, and from him I learned of Carrel, Carrel's creative genius, and something about the creative process itself. I don't know why, but almost immediately after I realized I had to write this address, I knew Carrel would be part of it.

Carrel was an experimental surgeon and never practiced clinical surgery, although he had taken clinical training in Lyons. He became interested in the problems of vascular anastomosis in 1894, after the president of France died in Lyons of hemorrhage from a lacerating stab wound of the portal vein, which the surgeons did not know how to repair.

As an intern in 1896, Carrel began the anastomosis work for which he gained considerable public notoriety, even at that early stage. He failed the final examination for staff appointment, called "the course," for the first time in 1901 and then again in 1902. It was made clear to him that he was never going to pass "the course," so, frustrated, he chose to emigrate to North America in 1904. He thought he would become a rancher.

Fate rescued Carrel, however, when Karl Beck invited him to Chicago, where Carrel continued his vascular surgery research in collaboration with Charles Guthrie at the University of Chicago. He was only there for about 2 years, but they were very productive years. He perfected end-to-end and then end-to-side anastomosis for arteries, using running sutures with the triangulation technique. Fine needles, fine sutures of silk coated with petrolatum to minimize vascular wall injury (remember waxing multifilament sutures?), a "no touch" technique, and impeccable asepsis were all part of the successful formula. From these, he moved to veno-arterial anastomoses, then to venous interposition grafts, and then to vein patches to widen primary closure. The Carrel button was the prelude to organ transplantation, and he achieved both autografts and allografts of thyroid, kidney, heart, and even limbs. All these achievements received great notoriety in the lay press. Some have said that it was Guthrie who should have gotten the credit. This is mistaken, as the subsequent careers of both Guthrie and Carrel have amply demonstrated. This was Carrel's work, which began in France and earned him the Nobel Prize in 1912, having been nominated by Karl Beck.

The rest of Carrel's career was spent at the newly endowed Rockefeller Institute for Medical Research in New York, where he became one of the first fellows in 1906. His recruitment there followed a most remarkable lecture, given at Johns Hopkins, that summarized his scientific accomplishments to that point. At the Rockefeller Institute, his research interests began to follow a very logical sequence—a process seen in many great creative geniuses. From his early work, he progressed to cell culture, and he became one of the founders of that field. Space does not permit a detailed examination of that work and its immense general importance to the tissue culture field. However, beginning in 1908, he perfected the methods of studying warm-blooded mammalian cells in culture to study wound healing, diseases such as cancer, and tissue preservation for later transplantation. Some cells from a well-publicized experiment on a chick heart were kept in continuous culture for 30 years—probably helped along with cell "refreshment" by zealous assistants, but, nevertheless, a real accomplishment.

From cell culture, he moved to organ culture, and it was the organ culture work that resulted in his collaboration with Lindbergh. In 1930, Lindbergh sought out Carrel to develop a method to stop and repair the heart, because Lindbergh's sister-in-law had rheumatic heart disease. The Carrel-Lindbergh perfusion apparatus was developed to be an artificial heart, but it was used in the study of perfused thyroid and hearts with successful preservation up to 3 weeks and in studies of organ function.

Carrel's research productivity essentially ended in 1938 with the publication of a book, *The Culture of Organs*, coauthored with Charles Lindbergh. However, Carrel's creativity is inspiring in its progression from the elemental anastomosis work to tissue culture, to organ culture, and then to the final step. One only needs to review his rich bibliography

Man
The Unknown

BY

ALEXIS CARREL

New York *and* London

HARPER & BROTHERS PUBLISHERS

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Contents

Fig 2. Title page and table of contents from *Man the Unknown*.

to see where his work was going—to studies of humankind itself. That comes later, but the associated contributions along the way are enormous.

Carrel's anastomotic work led to the first blood transfusion in New York City. The baby of a prominent surgeon with melena neonatorum was treated by Carrel, who anastomosed the father's radial artery to the baby's popliteal vein. All this was done on the dining room table. This took place before blood typing, but fortunately the 2 matched. The baby and the father's hand both survived.

The tissue culture work with its demands for asepsis led to the treatment of wounds in World War I with the Carrel-Dakin method, using Dakin's solution, which is still in occasional use today. During the war, Carrel established a hospital in France dedicated to the research and treatment of war wounds, and later he developed training methods for military surgeons in a demonstration hospital back at the Rockefeller Institute.

He also explored the possibilities of blood substitutes, the importance of maintaining normal body temperature during surgery, hypothermia for ischemic organ protection during surgical procedures, and endotracheal respiratory support for thoracic procedures.

The organ culture work was a prelude to extracorporeal circulation, decades before it became a reality. And Carrel's notable work on the preservation of tissue led to the era of arterial homografts and venous autografts for arterial reconstruction.

Despite his strenuous objections, Carrel was forced to retire from the Rockefeller Institute at the age of 65 in 1939, a politically motivated move that left him bitter. What particularly hurt him was that his Department of Experimental Surgery was closed. Carrel had become quite unpopular because of his perceived arrogance and aloofness. Part of this was a problem with language. Although he wrote in English beautifully, he never perfected the spoken word. Furthermore, his failure to become an American citizen, despite his having received so much financial and other support in America, rankled his superiors. In 1935, Carrel wrote a book for the lay readership titled *Man the Unknown*, which reflected his views, as a scientist, on life and the future of humankind. It became a best seller. It is easy to see, even from the table of contents, where he was going (Fig 2). This path was to be his ultimate undoing.

After his retirement in 1939, Carrel returned to France. While working on *Man the Unknown*, he got the idea that his final work should be in the creation

of an institute where all the problems of humankind could be scientifically and intellectually pursued and maybe solved. Unsuccessful in America, he was able to establish this institute, the Institute for the Study of Human Problems, in France in 1941. This was to be the culmination of his life's work, all headed to the betterment of humankind. It started out all right, but immediately ran into political trouble. By then, Carrel was having heart problems, and he died at age 71 in 1944. His institute was closed soon thereafter. Today Carrel's place in history in France is still quite controversial, and his memory in the United States has largely shrunk to the contributions related to vascular anastomoses.

Fifty years after his death, this man who achieved so much seems so under recognized. Why? One reason I focused on Alexis Carrel in this address is that I believe his significant legacy to vascular surgery deserves a more complete chronicle in the archives of the Society for Vascular Surgery. Another reason is that I wanted to use Carrel as a success/failure example in the legend-to-legacy assimilation.

There is no question about Carrel's legend. And there is no question he left an important legacy. Why isn't this legacy more apparent? At the risk of being posthumously critical, I say that Carrel failed himself and humankind by making some unfortunate leadership decisions, in both boldness and judgment. This is personal speculation, but I believe Carrel's leadership failure caused his legacy to fall short. This was the fault of genius, perhaps, but true anyway. I have selected two examples from a number of examples that support my view, one early in his life and one at the end.

I mentioned he never passed "the course," or the examination for a staff position in Lyons and, hence, emigrated to the United States. One reason for this is that, after a visit to the Shrine at Lourdes in 1903, he was led to believe he would never pass. Lourdes is the place where miracles happen, and he observed one. The story is beautifully told in a fictional, but thinly disguised autobiographical, work written by Carrel and published after his death, *A Voyage to Lourdes.* It is wonderful reading. In it, Louis Lerrac (Carrel spelled backwards) is a substitute physician for a pilgrimage to Lourdes. On the way, he encounters a young woman seemingly near death from what Carrel and others were quite sure was tuberculous peritonitis. Carrel observes that within hours after topical application of the water from the grotto, the woman miraculously begins to improve and ultimately recovers. She survived until 1938, when she died of natural causes. Was this a miracle or not? Carrel was almost convinced, but not quite. This baffled Carrel as a scientist and intrigued him as a mystic, but he couldn't reconcile it. His mysticism is out of the scope of this address, but his decision isn't. He hedged. His scientific work had already gained him considerable notoriety, so he spoke of it to the press. He wouldn't totally acclaim it as a miracle, and this made the church unhappy. He wouldn't declaim it as a mere hysterical conversion, so the medical establishment was also unhappy. This led to his ostracism. This was leadership failure as evidenced by lack of decisiveness or boldness and by lack of judgment by not just remaining silent in indecision. The result was his emigration, but fortunately, his career progressed.

It was different at the end of his life. All his scientific work was leading in one seemingly logical direction: the betterment of humankind or, from the French, the perfectibility of humankind; from tissue culture, to organ culture, to human culture or eugenics. This was not a great choice in France in 1941. This is what the Institute of Man was about—or so it was interpreted. That's why the free French or Vichy government financially supported it, and that's why the Nazi German regime allowed it in occupied France in Paris. His close friendship with Lindbergh, who was widely regarded to have German sympathies, also didn't help. This led to the accusation and belief that Carrel was a Nazi collaborator. The historic record shows that this is probably not true, but it killed Carrel's efforts, probably helped kill him, and insidiously diminished his reputation and, thereby, his real legacy.

So, what has this got to do with today? Actually, a great deal. With an understanding of legend, both people and events, and with an understanding of legacy and the reasons for it, we can more carefully consider the process of creating it. And that is leadership.

Leadership has a broader scope now, but it still comes down to individuals taking the responsibility of making decisions of importance to themselves and others. If the leadership fails, the legend may persist, but the legacy is diminished. This is what happened to Alexis Carrel.

The point, and the real message of this address, is our legacy—what we do today that will define our future. Certainly, we do have future legends in our field; many are in this room. History will be the judge of that.

However, in these troubled times, we need an intense focus on creating our legacy. And for this, we need lots of leadership, and we need it now. Boldness and judgment, somewhat lacking in my selection for legend, are both needed to face today's issues. Of the many issues, I will focus on two: creativity and identity.

We need leadership to better cultivate, stimulate, and support the creative process in vascular surgeons. Our young surgeons, in particular, are being stifled by economic and other pressures, driving them toward practical and easily identifiable productivity and away from fundamental creativity. This is greatly related to finance and financial support. One might argue that there is plenty of innovation going on. Certainly, endoluminal therapies are the stuff of Carrel's genius. However, this is mainly industry-based product development and not what I'm talking about.

Basic research productivity is good, but needs substantial nurturing in the environment of shrinking research support. Too much research funding is directed to PhDs who do research full time, and not enough funding is directed to surgeon scientists who not only understand the clinical problems needing research, but also how to research them—bedside to bench and back again. Our superb creation, the Lifeline Foundation, is a great step forward, but only a scant 14% of our membership support it financially. How are we possibly going to be able to convince others to support it at this rate? Moreover, please think about this: Without the philanthropic support of Rockefeller to the institute that bears his name, Carrel's work may never have progressed.

However, there's more to this than money. We must find ways to depressurize the academic surgery atmosphere and reward creativity that doesn't earn money, thereby allowing the creative spirit of our young and not-so-young surgeon investigators to prosper and their creative sap to flow. Research is vital to our legacy, because it stimulates both investigator and noninvestigator, resulting in an aura of inquisitiveness and motivation to search for better ways to do things. Without research, vascular surgery is in danger of becoming an intellectual desert, leaving us as mere technicians. Leadership today can and must keep us from that arid legacy.

Another great challenge needing leadership is in the area of identity, the definition of our specialty for the near and longer-term future. This will be the essence of the legacy of today's leadership. In the midst of this period of turbulent transition, I believe that we have an identity problem. We think we know who we are, but do we really? Others most certainly don't.

Our relationship with the American Board of Surgery (ABS) is a very good example of this and why it is so important for us to get this settled correctly now. This issue is not about board certification per se, but about certification clarifying our identity.

The problem is this: Vascular surgeons currently do not have the necessary authority within the ABS to shape the nature of our field—our identity, if you will. In spite of continuing and sincere efforts, we weren't making much progress with the ABS, which until now has considered us as general surgeons with some added exposure and experience with vascular problems. In their view, because vascular surgery is a primary component of general surgery training, anyone finishing a 5-year general surgery residency is qualified to do vascular surgery. Maybe this was true once, but it's preposterous now. Anyone starting a practice today and intending to do a significant amount of vascular surgery should have taken the specialized training and received certification that they have successfully completed it. So what's the big deal? We've had certification for 15 years. The problem has been that what defines being qualified for certification has not generally been under the authority of recognizable vascular surgeons. This is not to demean our earlier and current representatives to the ABS. They merely were not given the tools to conduct the business of vascular surgery, and that's what needs to change.

In fact, vascular surgery qualifies in every way to be a primary independent board. And so, in frustration, we formed our own board, the American Board of Vascular Surgery, in 1996. However, the authority to issue certificates must be gained from the American Board of Medical Specialists, and that is not a quick or straightforward process. Nor is there guaranteed success. In the meantime, in 1996, we also identified what the ABS would need to do for us to get the job done with them. Not wishing to see further fragmentation of surgery unless absolutely necessary, all agreed that a satisfactory solution within the ABS would be preferable, thereby keeping surgery whole. We have other pressing, nonsurgeon-related problems with which we need to contend. Because the ABS has never been particularly receptive to change, no one thought they could or would change enough to allow this to happen. But, in fact, the ABS did respond with substantial change in recognition of current realities.

In January 1998, the ABS voted to create a subspecialty board in vascular surgery under their aegis and invited us to join in this effort. The ABS Sub-Board for Vascular Surgery is to be made up of vascular surgeons we will select. Authority for the doing of the business of vascular surgery is to be delegated to our sub-board.

Despite this, we're not sure whether the ABS really will do what it recently has promised. And

even if they do, will it be enough? I don't know, but it is my personal conviction that the only way we will ever find out is to try it. Considerable skepticism exists as to whether the ABS can really "give" enough to make this work. I share that skepticism, but I also believe we need to try this now. We ultimately will have to make the first step based on good faith, which is a bold leadership step. And what's the downside? Only time. If it works out, we have established an important legacy regarding our future identity. If it doesn't, we still will have clarified our identity. If we fail in a genuine effort to make things work within the ABS, we are in a vastly strengthened position to proceed to full independence. Where leadership is needed is in the exercising of sufficient wisdom and judgment to recognize whether these goals are achieved. But, it would also be leadership failure if we were not to try this new relationship.

A broader identity issue involves the recognition that others would usurp what we do and, in so doing, trivialize nearly 100 years worth of experience beginning with, among others, the work of Carrel. But this is a challenge to more than just surgical technique or research; it challenges our role in the care of patients with vascular disease. The identity crisis comes from the rapid emergence of less-invasive technologies for vascular problems and the progression of these technologies, which has happened so fast that most vascular surgeons don't yet possess sufficient skills to do them. The bigger problem is that others, interventional radiologists and cardiologists, do possess sufficient skills. These technologies are based on fluoroscopy, guide wires, balloons, stents, and the like, and most surgeons have had scant experience, during training or since, with these approaches and techniques. Let us consider the problem: What do you suppose is going to happen as soon as endoluminal prosthetic devices are "miniaturized" enough for percutaneous placement?

So, what do we do about this? First, we should remember and then turn to our real strength to deal with the situation. This strength is our full understanding of the problems of our patients, their natural history, their interventions, and the results of what is done for them. This is what we know best, the right thing to do for a particular patient and when.

Most of us treat patients with mild-to-moderate problems expectantly. We resist intervening just because the lesion is there. With growing frequency, this is not the case with others. For example, incidental renal artery angioplasty for asymptomatic stenosis is being performed increasingly by cardiologists during procedures on the coronary arteries. I deplore these actions, because cardiologists don't really understand the consequences of their questionable initial treatment success. This does not mean that this treatment strategy is globally wrong. It does mean that this technology, as all new ones, needs to be addressed carefully and studiously by those who understand the problems in perspective—those who already have a demonstrated responsibility for intervention and a compulsion about learning the short- and long-term outcomes. This is the definition of the vascular surgeon.

In contrast, endoluminal therapy for aortic aneurysm is largely being evaluated by innovative vascular surgeons. This is the right way, but if we don't sustain leadership over the evolution of all such technology, all will suffer, in particular, our patients. I said earlier that we are the guardians of our patients' welfare. We must maintain this responsibility. If we fail this, we have failed in leadership, and our legacy is dark. It is from this base that we should proceed. So, what are the options? I offer 3. First, we can do nothing. Let matters unfold as they will. This is fundamentally unsound, because our basis of practice will be eroded by others who don't understand the diseases we treat as well as we do. Leadership boldness and leadership judgment, both required in today's instance, say that doing nothing is simply not an option.

Second, we can form alliances with radiology, cardiology, or both. In the past year, council representatives have met with both groups. Vascular radiologists already have developed and demonstrated considerable skill in the less invasive therapies of vascular lesions. Radiologists are also very concerned about the future of their field. The discussions with radiology are more advanced, because liaison there has considerable logic. Cardiologists, in contrast, seem less concerned, and some have declared that peripheral arterial interventions are a part of cardiology and, therefore, part of their turf. The problem here is real. So, there is considerable impetus to form "alliances" with both groups, for differing reasons, to avoid very destructive "turf" wars. Joint ventures in the form of centers exist today. A "hybrid" vascular interventionalist has been proposed, but how are we going to do that? Can you envision a nonsurgeon operating on someone now or anytime soon? On the other hand, can you envision a vascular surgeon doing all catheter-based interventions? I can. Actually, there are some sitting in the audience who already do this. To me, it is quite clear which way the technology/skill transfer needs to go, but it won't go there unless we make it happen.

The third option is just do it. Vascular radiologists have not been willing to teach vascular surgeons or our trainees catheter-based skills, but we are learning them anyway. With some careful but forceful leadership decisions, vascular surgeons in training will become competent in these skills, thereby ensuring that in the near future there may not be a problem. However, in the meantime, we have a large under served group in the middle—most of this audience. We must develop training and educational opportunities for anyone interested in acquiring these skills now. This will be tough to do. We have a good start in several venues, including that offered by the Joint Vascular Societies. But this is only a start; we must do more.

I think we must approach this issue boldly and broadly. As we train the residents and fellows to perform these innovative procedures, we must encourage them to do something heretofore difficult: reverse the process. The young must teach the old. For this to happen, the barriers, some practical, some economic, and certainly some traditional, need to be addressed. We should continue to explore working arrangements with those in other fields whom we know would usurp our identity, but see if we can somehow enfold them within us. If so, fine, but we can't just keep talking with them indefinitely. If we can't, we must continue as we have in the past and just do it. Learn it, do it, and teach it.

The lessons of history, observations of the present, and goals for the future are an important amalgamation from which I hope we can gain insight about how to proceed. Two years ago, our 50th president, Frank Veith, likened the evolution of vascular surgery to the observations of Charles Darwin on the evolution of the species. It is true that we are evolving, but we must be aggressively proactive in what is now very rapid evolution. In Darwin's terms, we have to be the fittest if we are to survive. Legend, leadership, legacy. We know the past, and we have the leadership. Now we need to create our legacy. Carpe diem.

I thank my wife, Cynthia, for her continued support and my friend Suzanne Gautreau for her able assistance and patience.

BIBLIOGRAPHY

1. Edwards WS. Alexis Carrel: visionary surgeon. Chicago: Charles Thomas Publishers; 1974.
2. Le Vay D. Alexis Carrel: The perfectibility of man. Rockville, Maryland: Kabel Publishers; 1996.
3. Malinin TI. The extraordinary career of Alexis Carrel. New York: Harcourt Brace Publishers; 1979.
4. Carrel A. Anastomose bout a bout de la jugulaire et de la Carotide Primitive. Lyon Med 1902;99:114.
5. Carrel A. La transplantation des veines et ses Applications Chinurgicales. Presse Med 1904;13:843.
6. Carrel A. Surgery of blood vessels and its applications to the changes of circulation and transplantation of organs. Johns Hopkins Hosp Bull 1906;17:236.
7. Carrel A, Guthrie CC. Anastomosis of blood vessels by the patching method and transplantation of the kidney. JAMA 1906;47:1648.
8. Carrel A, Lindbergh CA. The culture of organs. New York: Hoebner; 1938.
9. Carrel A. A voyage to Lourdes. Reader's Digest 1950 Sep;Book Sect.
10. Carrel A. Man the unknown. New York: Harper & Brothers; 1935.
11. Carrel A. Reflexions sur la condnite de la vie. Paris: Libraine Plon; 1950.
12. Veith FJ. Presidential address: Charles Darwin and vascular surgery. J Vasc Surg 1997;25:8-18.

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